

## Assessing GenX and other PFAS Exposure to Residents living around the Chemours Plant in Fayetteville

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**Background:** Many private wells around the Chemours plant in Fayetteville, NC, contain levels of GenX that exceed the state health advisory goal of 140 ppt, and GenX was measured at levels up to 1300 ppt (see attached map from NCDEQ available at their website). Interesting from an exposure assessment perspective, is that some of the contaminated wells are upstream of the plant, suggesting that air, in addition to water, may be an important exposure route for GenX.

As we are learning, there are many PFAS chemicals in the Cape Fear River as a result of chemical production at the Fayetteville plant since 1980. These include not only GenX, but also Nafion byproducts and a chemical known as PFMOAA. These chemicals are currently detectable at higher concentrations in the river than GenX. Data from two private wells suggest that current monitoring efforts, which are limited to GenX, PFOA, and PFOS, describe at most half of the total PFAS concentration in the groundwater. No data exist to date on PFAS levels in ambient air or local produce, although 2000 ppt of GenX has been measured in honey of a beekeeper near the Chemours plant (<http://www.wral.com/elevated-genx-levels-found-in-roberson-county-farmer-s-honey/17162672/>). Studying the exposure pathways for residents living around the plant will help us understand not only the chemical transport pathways for GenX, but also for related PFAS compounds. As there is little known about the environmental fate and transport of these chemicals, this study could provide critical data for exposure studies and animal toxicity testing in the future.

Residents as well as state regulatory agencies contacted CHHE about including this population in our study when they heard about the time-sensitive R21 in Wilmington, NC. At that time, there was no enumerated list of residents on private wells. Now that list exists at the NC DEQ, and they are willing to provide us with the names and addresses of people living near the plant, along with their well test results. We would like to request additional funds for our current R21 to include these individuals in our GenX Exposure Study and add a new aim to address the multiple exposure route challenges.

### Specific Aims:

The specific aims of our currently funded R21 are Aim 1) Community engagement and interaction to ensure community needs are addressed throughout the study, Aim 2) Characterize human exposure to GenX in the lower Cape Fear Region, and Aim 3) Perform clinical chemistry tests in blood and evaluate whether these are altered in the presence of GenX exposure. We plan to add a fourth aim *to conduct multi-media exposure assessment among the residents living near the Chemours plant.*

We will leverage our existing study protocol, community partnerships, and materials for report back, while adding in the collection of drinking water, house dust, and potentially passive air and food samples from residents living near the Chemours plant.

### Research Strategy:

**Population:** We plan to recruit 50 households living within 2 miles of the property line of the Chemours plant whose wells have been tested by Chemours and/or DEQ. We will focus on those homes that have exceeded the 140 ppt health goal, but will also include homes within that 2 mile radius with lower levels. To date, more than 100 homes have been identified that exceed the health goal for GenX, and well testing is ongoing. Consistent with our current protocol, we will enroll up to 4 people per household over the age of 5. Based on our experience in Wilmington, this household sampling method

helps with recruitment. We anticipate 3 people/household participating resulting in ~150 participants. Currently we have enrolled 310 people in Wilmington.

**Community Interaction:** We will continue to work with the Cape Fear River Watch as they also focus on this part of the Cape Fear River. Staff members of Cape Fear River Watch were critical for subject recruitment, water sample collection, Spanish language translation, and help during our field work. They also serve on our community science advisory panel. We would continue to work with them as well as a CHHE partner, Sustainable Sandhills, located in Fayetteville, NC. Our research team has connections to the local county health departments, and we would leverage these if we were given the funds to move forward. We will create a local Community Science Advisory Panel to provide input on report back to individuals and communities.

### **Sample Collection:**

*In home sampling:* From each of the 50 homes, we would plan to collect a tap water sample, house dust sample, a passive air sample, and, if possible, samples from garden produce and/or fish and game. Our current protocol includes tap water collection at the kitchen tap and we would continue this. We would collect one integrated sample of house dust using a standard vacuum technique (a number of authors have published on this) where we collect the sample from a known area (e.g. 1m x 1m) in up to six locations in the house (living room, bed rooms, dining room) {Eriksson, 2015 #; Padilla-Sanchez, 2016}. Passive air samples would be collected and analyzed using a method recently published by Ahrens {Ahrens, 2013}; we will plan to deploy these for 30 days and possibly collect repeat measures in a different season. The decision to collect additional air samples will be based on whether we detect chemicals in our first sampling period, whether there have been changes in air emissions at the plant, and logistical issues. There is interest in whether PFAS are present in food, following reports of detection of GenX in honey and other food {Scher, 2018}. We will work with our cooperative extension personnel to help identify the best plan for food sampling. All samples will be analyzed for GenX and 16 other PFAS compounds currently being measured in our funded study {Sun, 2016}.

*Blood and urine collection:* We will identify a convenient location for participants to come to for blood and urine collection, along with questionnaire administration. With 180 people, we should be able to collect these samples over the course of a weekend. We will also administer our study questionnaires at this time. All samples will be analyzed for GenX and 16 other PFAS compounds currently being measured in our funded study. Blood will also be analyzed for lipids, thyroid function, and a comprehensive lipid panel. Urine samples will be analyzed for protein and creatinine as well.

*Questionnaire:* Our questionnaire will be revised to include questions relevant to multi-pathway exposure assessment, but to the extent possible we will use the same questionnaire so that we can combine data from Wilmington and Fayetteville when appropriate.

### **Statistical Analysis:**

We will conduct the same statistical analysis as previously funded. We will test whether GenX and other PFAS are detectable in this population. We will look at factors that predict GenX level in people, both in the Fayetteville community alone and in Fayetteville and Wilmington together. We will add a time covariate to these models that accounts for when the water sample was collected and when the participant started using bottled water. We will assess whether GenX levels are associated with lipid level, thyroid function, and the results of the comprehensive lipid panel; we will merge the two datasets when appropriate to increase the statistical power to answer this question. Additionally, unique to this analysis, we will test whether GenX and other PFAS chemicals are detectable in air, house dust and garden products. We will also evaluate whether PFAS chemicals not measured by Chemours/DEQ, such as PFMOAA, are detectable in groundwater upstream of the plant. We will evaluate the correlation

between air, house dust, water, and garden levels. Additionally, we will look at how the “fingerprint” of these chemicals varies across all environmental and biologic media.

**Report back to the community:** We will leverage our experience in Wilmington to facilitate report back of results to participants in Fayetteville. Based on the advice that we have received from our Community Science Advisory Panel, we will report back results as we have them. We are currently in the process of developing a document to report back results of GenX and the 16 other PFAS that we have measured. Because not all of the newer PFAS have analytical standards, we are unable to quantify the concentration of these compounds nor do we have health goals or toxicology data to guide this report back. We are working with the community now regarding report back, so these challenging issues of how to communicate results on this emerging topic will be addressed prior to the need to report back in Fayetteville. It is our plan to report back to both individuals and the community in a timely fashion.

**Estimated Budget:** We can leverage our existing personnel and resources to make this cost efficient. We would hire a new chemist to perform the chemical analyses and would increase the hours of our study manager over the course of the study. We estimate that this increased effort would cost somewhere between \$125,000 and \$140,000. We will prepare a final budget through our budget office if there is support for this proposed supplement.

## References

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Sun M, Arevalo E, Strynar M, Lindstrom A, Richardson M, Kearns B, Pickett A, Smith C, Knappe DRU. 2016. Legacy and Emerging Perfluoroalkyl Substances Are Important Drinking Water Contaminants in the Cape Fear River Watershed of North Carolina. *Environmental Science & Technology Letters* 3(12):415-9.

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exceed health goal.  
Light Blue is non detect